

# A unified analysis of anaphoric expressions in spoken and signed languages

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# Anaphoric expressions

Referential expressions that refer to familiar entities.

Dependent, but not syntactically bound (Safir 2004)

## **Familiar:**

- Previous mention
- Familiar by common knowledge

How do we know which expression to use? A lot of options.

# Anaphoric expressions

There are many anaphoric expressions.

(1) I met a girl. [DP] looked happy.

- |                    |                           |
|--------------------|---------------------------|
| - <i>she</i>       | pronoun                   |
| - <i>the girl</i>  | definite description      |
| - <i>that girl</i> | demonstrative description |
| - $\emptyset$      | null argument             |
| - <i>girl</i>      | bare noun                 |

# Anaphoric expressions

Anaphoric expressions are often **interchangeable**:

(2) I met a girl. {She, The girl} looked happy.

But we see an interaction:

(3) Every girl<sub>i</sub> thinks that Jin likes { her<sub>i/j</sub>, the girl<sub>\*i/j</sub> }. [reading]

(4) A girl entered the room. {She, The girl} looked happy. [processing]

# Interaction

Processing studies:

## Repeated Name Penalty

Jin entered the stage.

#Jin/He...

name > pronoun

## Repeated Noun Penalty

The singer entered.

#The singer/He...

noun > pronoun

## Overt Pronoun Penalty

Jin entered the stage.

#He/Ø...

overt > null

[cf. Gordon et al. 1993; Van Gompel et al. 2004]

# Interaction

## Referent tracking studies from corpus

[Ariel 2001; Gundel et al. 1993]

### (5) **Accessibility Hierarchy** [Ariel 2001]

full name > long definite description > short definite description > last name >  
first name > distal demonstrative + modifier > proximate demonstrative +  
modifier > distal demonstrative + NP > proximate demonstrative + NP > distal  
demonstrative > proximate demonstrative > stressed pronoun > unstressed  
pronoun > cliticized pronoun > verbal person inflections > zero

### (6) **The Givenness Hierarchy** [Gundel et al. 1993]

in focus it	>	activated that, this, this N	>	familiar that N	>
uniquely identifiable the N	>	referential indefinite this N	>	type identifiable a N	

# No unified semantic analysis

*she*

## **pronoun**

variables? hidden definite  
descriptions?

[Evans 1980; Kamp 1981]

*the girl*

## **definite description**

uniqueness? familiarity? both?

[Heim 1982; Schwarz 2009]

*that girl*

## **demonstrative**

pointing! Extended definites

[Kaplan 1969; King 2008]

$\emptyset$

## **null argument**

constraints on pro-drop,  
different interpretations

[Duguine 2014; Kurafuji 2019]

*girl*

## **bare noun**

interpretations, constraints,  
unique vs. anaphoric

[Chierchia 1998b; Dayal 2009; Jenks 2015]

# What we have so far

## Semantics

Disjoint discussions on what  
each expression denotes



## Language Use

Variation and distribution;  
Interaction in processing



### **How are these two related?**

What are the underlying denotations that result in the  
distributional patterns we see?



# Preview

The interpretive and distributional properties of an anaphoric expression is a result of **semantic/pragmatic competition**.

## **Unified analysis of anaphoric expressions**

- Share the underlying structure
- Differ only in restrictions

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- uniformly derives independently observed phenomena across languages

# Preview

The interpretive and distributional properties of an anaphoric expression is a result of **semantic/pragmatic competition**.

## Unified analysis of anaphoric expressions

- Share the underlying structure
- Differ only in restrictions

- naturally derives a competition through independently motivated semantic economy principles
- uniformly derives independently observed phenomena across languages
- **links semantics to language use**

# Implications

I. Derives gradient properties such as variation and interaction

## Semantics

Unified analysis

## Language Use

Variation

Interaction



**Semantic competition**

# Implications

II. Allows distributional patterns to inform semantic analysis

## Semantics

Analysis of

- pointing in ASL
- (null arguments)

## Language Use

Distribution



**Semantic competition**

# Overview

Motivation: Bare Noun Blocking

A unified analysis

Semantics → Language use

Cross-linguistic variation

Variation across speakers

Language use → Semantics

Pointing in sign languages

Conclusion

## **Motivation: Bare Noun Blocking**

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# Bare argument languages

Languages that **freely allow bare nouns** as arguments to predicates.

- Excludes languages like English      *'Dinosaurs are everywhere.'*

Languages investigated:

- Korean, Japanese, Mandarin, Thai, Turkish
- Russian, Belarusian, Polish
- Hindi
- American Sign Language (ASL)

# Bare argument languages

Bare arguments in these languages can be definite.

[Dayal 2004; Jenks 2015; Jiang 2012; Lee 1992; Schwarz 2009]

- (7) mkamləŋ həw.  
dog            PROG bark  
'The dog is barking.'

[Thai; Jenks 2015]

**But which definite?**

# Licensing definites

What does a definite denote?

- uniqueness (Frege 1892; Russell 1905)
- familiarity (Heim 1982; Roberts 2002)

*'The moon is bright.'*

*'I saw a mouse. The mouse..'*

**Schwarz 2009, 2013:** Both must be semantically distinguished.

	English	Fering	German	Thai [Jenks 2015]
UNIQUE	<i>the</i>	<i>a</i>	<i>im</i>	N
FAMILIAR	<i>the</i>	<i>di</i>	<i>in dem</i>	N CL DEM

# Uniqueness

Bare arguments can be **uniqueness** denoting.

- (8) tal-i            palk-ta.  
moon-NOM bright  
'The moon is bright.' [Korean]

- (9) ay    parlak  
moon shiny.3SG  
'The moon is shining.' [Turkish]  
[Deniz Satik, Hande Sevgi, p.c.]

- (10) duan̄-can sàwàan̄ mâak.  
moon    bright    very  
'The moon is very bright.' [Thai; Jenks 2015]

- (11) chand chamak raha            hai.  
moon shine    AUX.PROG AUX.PRS  
'The moon is shining.' [Hindi]  
[Vyom Sharma, Ankana Saha, p.c.]

# Anaphoric bare nouns

## New Observation:

Bare argument languages differ in the anaphoric ability of the bare noun in **intersentential anaphora**:

'I bought book. [Book] was expensive.'

ABN	*ABN
Korean, Turkish Japanese	Hindi, Thai

*ABN: Anaphoric Bare Noun*

## Data: ABN languages

Languages that allow bare nouns in intersentential anaphora:

- (12) ecey chayk-ul sa-ss-ta. **chayk-un** pissa-ss-ta.  
yesterday book-ACC buy-PAST-DECL book-TOP expensive-PAST-DECL  
'I bought a book yesterday. The book was expensive.'  
[Korean]
- (13) watashi-wa hon-o kat-ta. **hon-wa** takaka-ta.  
I-TOP book-ACC buy-PAST book-TOP expensive-PAST  
'I bought a book. The book was expensive.'  
[Japanese]  
[Ryoichiro Kobayashi, p.c.]
- (14) bir kitap al-dı-m. **kitap** pahalı-ydı.  
INDEF book buy-PAST-1SG Book expensive-PAST  
'I bought a book. The book was expensive.'  
[Turkish]  
[Deniz Satik, Hande Sevgi, p.c.]

## Data: \*ABN languages

Languages that disallow bare nouns in intersentential anaphora:

- (15) Maine ek kitab kharid-i. **\*(Vo) kitab** mehngi thi.  
1SG.ERG one book.SGF buy-PAST.SGF (that) book.SGF expensive be.PAST.SGF  
'I bought a book. The book was expensive.'  
[Hindi]  
[Vyom Sharma p.c.]  
[variation; discussed later]
- (16) miawaan phom cee kap nakrian khon nin. **nakrian** chalaat maak.  
yesterday I meet with student CLF INDEF student clever very  
'Yesterday I met a student. Students are very clever.'  
[Thai; Jenks 2015]

# Generalization

ABN	*ABN
Korean, Turkish Japanese	Hindi, Thai
Bare nouns allow anaphoric use	Bare nouns restrict anaphoric use



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**[Q]** Do bare nouns in \*ABN languages block anaphoric uses?

# Generalization

ABN	*ABN
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Bare nouns allow anaphoric use	Bare nouns restrict anaphoric use

**[Q]** Do bare nouns in \*ABN languages block anaphoric uses?

→ No. This is a **derived property**.

\*ABN: bare nouns blocked by **morphologically simplex pronoun**.

# Bare Noun Blocking

Generalization:

**If a bare argument language has morphologically simplex pronouns ('simplex pronouns') for third person reference, bare nouns are blocked from intersentential anaphora when simplex pronouns can resolve the referent.**

# Bare Noun Blocking

**Thai:** \*ABN language that has simplex pronouns.

## Pronouns

	SG	PL
1	chăn	rao
2	kun	
3	kăo, man	pûak kăo

## Demonstratives

- dtó nán ('table that')
- pronominal uses possible

[<https://www.thailanguagehut.com>]

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**Hindi:** No morphological distinction, but fully productive use of pronominal demonstrative vo

- vo *kitab* ('that book')
- vo ('he', 'she', 'it')

# Bare Noun Blocking

**Korean:** ABN language that does *not* have simplex pronouns

## Pronouns

	SG	PL
1	na	wuli
2	ne	nehuy
3	ku NP	ku NP-tul

## Demonstratives

- **ku** chayksang ('that desk')
- pronominal use restricted

- (17)
- |    |                                 |         |
|----|---------------------------------|---------|
| a. | <i>kyay: ku ay</i> ('that kid') | reduced |
| b. | <i>ku salam</i> ('that person') | DEM N   |
| c. | <i>ku kes</i> ('that thing')    | DEM N   |

# Bare Noun Blocking

Other ABN languages

**Japanese:** All pronouns are (reduced forms of) adnominal demonstratives

[Ryoichiro Kobayashi, Michael Erlewine, pc]

- (18) a. *ano hito* ('that person')  
b. *ko/so/a-itsu* ('this/that guy')

DEM N

DEM CL

**Turkish:** Distal demonstrative description with *o* used; pronominal use restricted to animate entities

- (19) Bir kitap al-dı-m. {Kitap / \*o / o kitap} pahalı-ydı.  
INDEF book buy-PAST-1SG Book 3SG that book expensive-PAST  
'I bought a book. The/that book was expensive.'

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# Bare Noun Blocking

		focusing on [3rd person] [sg]	
		Simplex Pronouns	Adnominal Anaphors
ABN	Korean		<i>ku salam</i>
	Turkish		<i>o kiři</i>
	Japanese	<i>non-existent/restricted</i>	<i>ano hito</i>
*ABN	Hindi	<i>vo</i>	<i>vo kitab</i>
	Thai	<i>kǎo, mán</i>	<i>nan nakrian</i>

**Only in the languages that lack simplex pronouns,  
bare nouns are used anaphorically.**



# How does this generalization work?

Recall:

*she*

## **pronoun**

variables? hidden definite  
descriptions?

[Evans 1980; Kamp 1981]

*the girl*

## **definite description**

uniqueness? familiarity? both?

[Heim 1982; Schwarz 2009]

*that girl*

## **demonstrative**

pointing! Extended definites

[Kaplan 1969; King 2008]

∅

## **null argument**

constraints on pro-drop,  
different interpretations

[Duguine 2014; Kurafuji 2019]

*girl*

## **bare noun**

interpretations, constraints,  
unique vs. anaphoric [Chierchia

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# How does this generalization work?

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[unique vs. anaphoric](#)

[Chierchia 1998b; Dayal 2009; Jenks 2015]

**Combine into a  
unified theory!**

## **A unified analysis**

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# Unified theory

Idea: All anaphoric expressions share the same semantic structure

sup	$[\lambda x. \text{entity}(x) \wedge \dots]$
supremum operator	restrictions
'the maximal x such that x is an entity and ...'	

# Unified theory

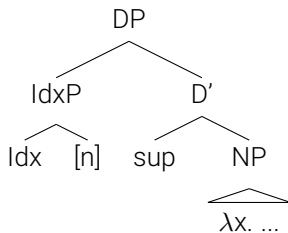
Idea: All anaphoric expressions share the same semantic structure

sup	$[\lambda x. \text{entity}(x) \wedge \dots]$
supremum operator	restrictions
'the maximal x such that x is an entity and ...'	

↑  
**kind and number of restrictions**

# Anaphoric DP structure

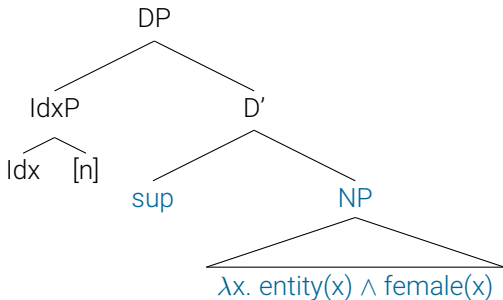
$\llbracket DP_n \rrbracket =$



$\llbracket_{DP}$	$\llbracket n \rrbracket$	$\llbracket sup$	$\llbracket_{NP} \lambda x: \text{entity}(x) \wedge \text{female}(x) \dots \rrbracket$	$\rrbracket$
	index	maximality operator	restrictions	

## Anaphoric DP structure

$\llbracket \text{she}_7 \rrbracket =$



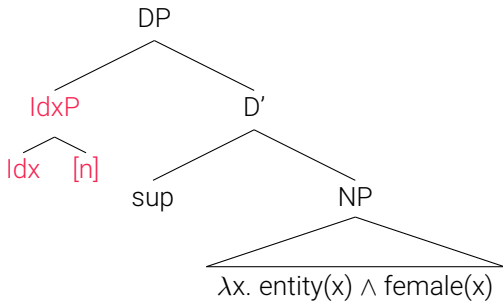
$$\llbracket \text{sup} \rrbracket = \lambda P \iota z. \forall x [\forall y [P(y) \rightarrow y \sqsubseteq x] \rightarrow z \sqsubseteq x]$$

'smallest individual  $x$  such that all individuals  $y$  that is  $P$  form part of  $x$ '



## Anaphoric DP structure

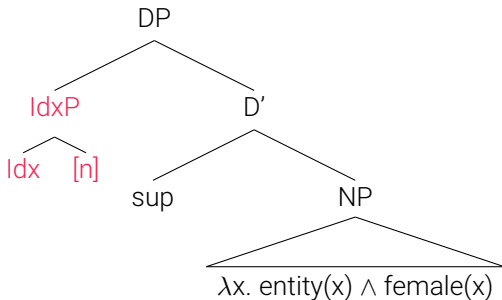
$\llbracket \text{she}_7 \rrbracket =$



$\llbracket \text{Idx} \rrbracket = \lambda n. \lambda x_e: x = g(n). x$

## Anaphoric DP structure

$\llbracket \text{she}_7 \rrbracket =$



$$\llbracket \text{Idx} \rrbracket = \lambda n. \lambda x_e: x = g(n). x$$

**the (plural) individual that consists of all females**  
**defined iff  $x = g(7)$**

## Semantic restrictions

$\text{entity}(x)$	true if $x$ is an entity
$\phi(x)$	true if $x$ meets the $\phi$ feature requirements (gender, number, etc.)
$\llbracket \text{NP} \rrbracket(x)$	true of $x$ if $\llbracket \text{NP} \rrbracket(x)=1$
$R(x)$	true of $x$ if $R(x)=1$

### Denotations: Universal

- a.  $\lambda x. \text{entity}(x)$
- b.  $\lambda x. \text{entity}(x) \wedge \phi(x)$
- c.  $\lambda x. \text{entity}(x) \wedge \llbracket \text{NP} \rrbracket(x)$
- d.  $\lambda x. \text{entity}(x) \wedge R(x)$
- e.  $\lambda x. \text{entity}(x) \wedge \llbracket \text{NP} \rrbracket(x) \wedge R(x)$
- f. ...

# Language-specific lexicalizations

## English

$$\llbracket \text{she} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x)]$$

$$\llbracket \text{the girl} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \llbracket \text{girl} \rrbracket(x)]$$

$$\llbracket \text{that}_R \text{ girl} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \llbracket \text{girl} \rrbracket(x) \wedge R(x)]$$

$$\{ \textit{she}, \textit{the girl}, \textit{that girl} \}$$

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$$\{ \textit{she}, \textit{the girl}, \textit{that girl} \}$$

## Korean

$$\llbracket \text{sonye} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \llbracket \text{girl} \rrbracket(x)]$$

$$\llbracket \text{ku}_R \text{sonye} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \llbracket \text{girl} \rrbracket(x) \wedge R(x)]$$

$$\{ N_{\text{DEF}}, \text{DEM } N \}$$

# Implications

A pronoun differs from a definite *only* in **its restrictions**.

$$\llbracket \text{she} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x)]$$

$$\llbracket \text{the girl} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \text{girl}(x)]$$

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Different from:

- general assumptions [Heim & Kratzer 1998]

$$\llbracket \text{she} \rrbracket = x_n$$

$$\llbracket \text{the girl} \rrbracket = \iota x. \text{girl}(x)$$

- e-type analyses [Elbourne 2005; Evans 1980]

$$\llbracket \text{she} \rrbracket = \llbracket \text{the girl} \rrbracket = \iota x. \text{girl}(x)$$

$$\llbracket \text{the girl} \rrbracket = \iota x. \text{girl}(x)$$

# Implications

Independently motivated economy principles like *Minimize Restrictors!* [Schlenker 2005] can be applied directly.

Recall redundancy: {She > #The girl} looked happy.

[Ahn 2019]	[Heim & Kratzer 1998]	[Elbourne 2005]
$\sup[\text{entity}(x) \wedge \phi(x)]$	$x_n$	$\iota x. \text{girl}(x)$
$\sup[\text{entity}(x) \wedge \phi(x) \wedge \text{girl}(x)]$	$\iota x. \text{girl}(x)$	$\iota x. \text{girl}(x)$
<b>Minimize Restrictors!</b>		
[Schlenker 2005]		
no redundant restrictions	N/A	N/A
<i>my father &gt; #my tall father</i>		





# Unified theory of anaphoric expressions

## Proposal:

- restrictions  $\{\text{entity}(x), \phi(x), \llbracket \text{NP} \rrbracket(x), R(x)\}$
- supremum operator
- presuppositional index  $\pi: x = g(n)$

**Consequence:** Semantic economy principles can apply directly

- *Minimize Restrictors* [Schlenker 2005]
- *Efficiency* [Meyer 2014]
- *Maximize Presupposition!* [Heim 1991]

# Going back to Bare Noun Blocking

## \*ABN Languages:

Simplex pronouns are **simpler** than bare nouns.

- Less semantic content (no NP property)
  - $\llbracket \text{kǎo} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{animate}(x)]$
  - $\llbracket \text{nakrian} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{animate}(x) \wedge \text{student}(x)]$

[Thai]

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- $\llbracket \text{nakrian} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{animate}(x) \wedge \text{student}(x)]$

When both are possible, **the more complex form is blocked**  
due to semantic economy (*Minimize Restrictors!*, Efficiency [Meyer 2014]).

$\{ \text{kǎo} , \text{nakrian} , \dots \}$

# Going back to Bare Noun Blocking

## ABN Languages:

No simplex pronouns that can block bare nouns.

- Bare noun is the lowest element in the scale
- The only other alternative: *ku haksayng*

{ ***haksayng*** , *ku haksayng* }

- $\llbracket \text{haksayng} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \text{student}(x)]$  [Korean]
- $\llbracket \text{ku haksayng} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge \text{student}(x) \wedge R(x)]$

# Bare Noun Blocking

## ABN languages

N<sub>def</sub>

## \*ABN languages

pronoun

~~N<sub>def</sub>~~

- Not that \*ABN languages block anaphoric bare nouns
- Bare nouns are *blocked* by simplex pronouns in \*ABN languages

# Advantage

## Context-sensitivity can be captured.

- As soon as we add another possible referent in the context, bare noun can be used in \*ABN languages.

[see Jenks 2015 for discussions in Thai]

Hindi (Vyom Sharma, pc):

I bought *book<sub>i</sub>*. Book was expensive. *kitab<sub>\*i</sub>*

I bought *book<sub>i</sub>* and *cup<sub>j</sub>*. Book was expensive. *kitab<sub>i</sub>*

(20) Maine ek kitab aur ek cup kharid-a. **Kitab** mehngi thi.  
1SG.ERG one book.SGF and one cup buy-PAST.SGF book.SGF expensive be.PAST.SGF  
'I bought a book and a cup. The book was expensive.'

# Summary

1. A unified semantic account of anaphoric expressions
  - extensionally equivalent
  - differs in restrictions
2. Semantic economy principles can derive competitions
  - Bare Noun Blocking
  - (null vs. overt pronouns in Romance)
  - (pronoun vs. demonstratives in English)
  - (personal vs. demonstrative pronouns in German)



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  - (personal vs. demonstrative pronouns in German)

## Implications

- **Semantics** → **Language use**: capturing variation
- **Language use** → **Semantics**: pointing in sign languages

**Semantics → Language use**

---

# Semantics → Language use

Derives gradient properties such as variation and interaction

## Semantics

Unified analysis

## Language Use

Variation

Interaction



**Semantic competition**

# Deriving variation

## 1. Cross-linguistic variation

- When does the competition lead to a penalty vs. a blocking?

Penalty vs. Blocking

## 2. Variation across speakers

- Anaphoric ability of bare noun depends on pronoun status

Interaction at the individual level

# Penalty vs. Blocking

## Repeated Noun/Name Penalty

- Adult English speakers take longer to process repeated nouns/names than pronouns. [Almor 1999; Gordon et al. 1993; Song & Fisher 2005]

A doctor<sub>i</sub> walked with Jin. The doctor<sub>i</sub> told Jin a story.

**longer!**

A doctor<sub>i</sub> walked with Jin. She<sub>i</sub> told Jin a story.

# Penalty vs. Blocking

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**longer!**

A doctor<sub>i</sub> walked with Jin. She<sub>i</sub> told Jin a story.

[Ahn 2019]: Use of higher elements in the scale has semantic consequences. (domain accommodation)

# Accommodation

I met a doctor. {She, The doctor} looked happy.

- Presupposition of *the doctor* is weaker than that of *she*.
- Use of the weaker expression results in an anti-presupposition  
[Heim 1991; Sauerland 2008]
- Use of *the doctor* implies that there was no unique female entity

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**Domain widening** as accommodation.

$$\{ j_3 \} \rightarrow \{ j_3, k_7 \}$$

- constrained by/indicated by **focus** that triggers alternatives.

[The doctor] / [That doctor] looked happy.

*the DOCTOR*    *THAT doctor*



# Processing costs of accommodation

- Processing costs of presupposition accommodation

[cf. Domaneschi & Di Paola 2018; Schwarz 2014; Singh et al. 2016; Tiemann et al. 2015, a.o.]

## Semantics

Shared structure  
Competition

## Language Use

Processing penalties



Domain widening

$\{ j_3 \} \rightarrow \{ j_3, k_7 \}$

## Penalty vs. Blocking

A girl walked in. {She / The girl / That girl} looked happy.  
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[Q] What determines whether competition leads to a penalty vs. a complete blocking?

**The status of bare nouns in bare argument languages.**

## Bare nouns

Something we know about bare nouns in these languages:

[Chierchia 1998b; Dayal 2004; Déprez 2005; Jenks 2015; Jiang 2017]

(21) *nakrian*: the student / a student /  $\cap$ STUDENT / students

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→ generic reading in Thai; indefinite in Hindi
- English: *the doctor* does not have non-definite readings.  
→ processing difficulty
- Thai: *nan nakrian* (only anaphoric) is not blocked.

I met student. {*kǎo*, *nakrian*, *nan nakrian*} was clever.

blocked      possible



# Processing vs. Blocking - Summary

## Semantics

$\iota x. [...]$

Competition



Domain widening

$\{j_3\} \rightarrow \{j_3, k_7\}$



Penalty

# Processing vs. Blocking - Summary

## Semantics

$\iota x. [...]$

Competition



Domain widening

$\{ j_3 \} \rightarrow \{ j_3, k_7 \}$

Alternative meanings

$\exists, K, \iota$



Penalty



Blocking

# Deriving variation

## 1. Cross-linguistic variation

- When does the competition lead to a penalty vs. a blocking?

Penalty vs. Blocking

## 2. Variation across speakers

- Anaphoric ability of bare noun depends on pronoun status

Interaction at the individual level

# Interaction at the individual level

Variation in Mandarin and Hindi:

## Mandarin

- Only subject bare nouns can be anaphoric
- Non-subject bare nouns can be anaphoric

[Jenks 2018]

[Dayal & Jiang in prep]

## Hindi

- 3 speakers rejected anaphoric bare nouns
- 1 speaker allowed anaphoric bare nouns
- 1 speaker showed variation

## Variation in Bare Noun Blocking

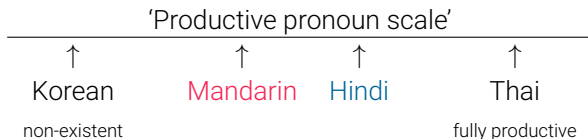
Present theory can predict variation in Hindi and Mandarin.

(And *specifically* in Hindi and Mandarin, not others)

# Variation in Bare Noun Blocking

Present theory can predict variation in Hindi and Mandarin.

(And *specifically* in Hindi and Mandarin, not others)



- **Mandarin** simplex pronouns (*ta*), but not fully productive (Sun 2006)
- **Hindi** no distinct simplex pronouns but productive

## Interaction at the individual level

## Interaction at the individual level

Hindi speaker:

- (22) Maine ek kitab kharid-i. **Kitab** mehngi  
1SG.ERG one book.SGF buy-PAST.SGF book.SGF expensive  
thi.  
be.PAST.SGF  
'I bought a book. **The book** was expensive.'
- (23) Maine ek paudha kharid-a. maiN \***paudhe**-ko roz  
1SGM.ERG one plant.SGM buy-PAST.SGM 1SGM plant-DAT daily  
pani de-ta huN.  
water give-IMPRF.SGM be.PRS.1SG  
'I bought a plant. I water **the plant** everyday.'

## Grammaticality depends on availability of pronouns

(22) 'I bought a book. { **book**, \***vo** } was expensive.'

(23) 'I bought a plant. I water { \***plant**, **use** } everyday.'



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Variation on pronoun status → variation on anaphoric bare nouns.

- The competition still applies categorically.
- But the alternatives may vary in a gradient way.
  - Animacy, information structure, pragmatic constraints, etc.

## Interaction - Summary

- Parametric, categorical restrictions
  - Mandarin non-subject nouns do not allow anaphoric reading.  
[Jenks 2018]
- Wide range of gradient data:
  - Context sensitivity (number of referents)
  - Individual-level variability

**The competition mechanism allows for a more systematic account for variation than hard-wired restrictions.**

- depends on the availability of alternatives, which is determined in a gradient nature.

## **Semantics→Language use: Summary**

### **Capturing variation**

There are many patterns we see in language use. These result from combinations of categorical rules and gradient factors.

The unified theory allows us to make systematic predictions on such gradient patterns: processing penalties, competition, and variation.

- Without language-specific stipulations

→ Empirical advantage over hard-wired principles.

**Language use → Semantics**

---

# Language use → Semantics

Allows distributional patterns to inform semantic analysis

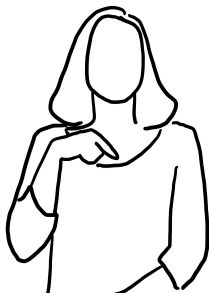
**Semantics**  
pointing in ASL

**Language Use**  
Distribution



**Semantic competition**

# IX



IX<sub>1</sub>



IX<sub>A</sub>

- **IX**: indexical pointing handshape used to refer to entities

# Loci

IX can refer to entities not present in the context ( $IX_{LOC}$ )

[Friedman 1975]

- (24) YESTERDAY JOHN  $IX_A$  MEET  $IX_B$  DOCTOR.  $IX_B$  BUSY. [ASL]  
'Yesterday John met a doctor. The doctor was busy.'



## Setting up referents in space

[Lillo-Martin & Klima 1990]:

loci: overt instantiations of **indices** that occur with pronouns

(25) Jin<sub>1</sub> met Jimin<sub>2</sub>. She<sub>1</sub> helped her<sub>2</sub>.

- $g = \{ \langle 1, jin \rangle, \langle 2, jimin \rangle \}$
- $\llbracket she_1 \rrbracket^g = \llbracket x_1 \rrbracket^g = g(1) = jin$

IX<sub>A</sub> is like she<sub>1</sub>

[cf. Barberà & Zwets 2013; Schlenker 2011; Schlenker et al. 2013; Steinbach & Onea 2015]



# A puzzle

[Ahn, Kocab, & Davidson 2019] **An odd case of anaphoric indices**

(At least not the one we assume for spoken languages)

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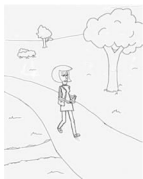
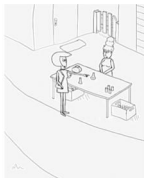
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**null arguments, bare nouns, IX<sub>NEUT</sub>**
  - ☞ infrequent in natural production data  
**6/340 tokens [Czubek 2017; Frederiksen & Mayberry 2016]**

# Production data

Natural production studies [Czubek 2017; Frederiksen & Mayberry 2016]

12 native ASL signers; 6-panel picture



# Production data

How frequent is IX<sub>LOC</sub>?

- Production studies: **not very frequent.**

[Czubek 2017; Frederiksen & Mayberry 2016]

	Null Arg	CL	N	<b>IX</b>	F-S	Total
Maintained	.73 (219)	.20 (63)	.07 (21)	<b>.02 (6)</b>	.04 (1)	310
Reintroduced	.67 (20)	0 (0)	1 (10)	<b>0 (0)</b>	0 (0)	30

IX is more frequent in more complex discourse.

[Czubek 2017]

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felicitous with >2 referents [Ahn, Kocab, & Davidson 2019]

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  - ☞ not always licensed  
\*inanimates [Ahn, Kocab, & Davidson 2019]

# Felicity judgments

Felicity judgments [3 native ASL signers]

[Ahn, Kocab, & Davidson 2019]

## **IX<sub>LOC</sub> is not obligatory or preferred:**

- when it is obvious who the referent is (null or IX<sub>NEUT</sub> preferred)

(26) #BOY IX<sub>A</sub> ENTER CLUB. IX<sub>A</sub> DANCE.

(27) BOY IX<sub>A</sub> ENTER CLUB. SEE GIRL IX<sub>B</sub> READ. IX<sub>A</sub> DANCE.

'A boy entered a club. (He saw a girl read). He danced.'



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'A boy entered a club. (He saw a girl read). He danced.'

## **IX<sub>LOC</sub> is not licensed:**

- with inanimate referents.

(28) MARY IX<sub>A</sub> BUY BOOK ?IX<sub>B</sub>. ?IX<sub>B</sub> EXPENSIVE.

(intended) 'Mary bought a book. The book was expensive.'

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**IX<sub>LOC</sub>: a restriction!**

## IX<sub>LOC</sub> as a restriction

$\llbracket \text{that linguist}_R \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{linguist}(x) \wedge R(x)]$

- Exophoric demonstratives in spoken languages:

$R$  is filled with a locational restriction provided by 👉

(29) [That bottle]  is blue.

- $\llbracket \text{that bottle}_{\rightarrow A} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{bottle}(x) \wedge \llbracket \rightarrow_A \rrbracket(x)]$
- $\llbracket \rightarrow \rrbracket = \lambda a_l. \lambda x_e. x \text{ is at } a$   
(note that  $a$  is always saturated as soon as you point)

## $IX_{Loc}$ as a restriction

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Idea:  $\llbracket IX_A \rrbracket = \llbracket \rightarrow_A \rrbracket = \lambda x. x \text{ is at } a$



## **IX<sub>LOC</sub> as an anaphoric expression**

(30) IX<sub>A</sub> DANCE.

-  $\llbracket IX_A \rrbracket = \llbracket \emptyset IX_A \rrbracket = \sup [\text{entity}(x) \wedge \text{at-A}(x)]$  'the one at A'

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## **IX<sub>LOC</sub> in the introductory use**

(anchoring use; Barberà & Zwets 2013)

**JIN IX<sub>A</sub>** SIT-IN CLASS.  $\emptyset$  **IX<sub>A</sub>** DANCE.  
supplementary restrictive

'Jin (who is at A) .. The entity that is at A ..'



$$[[IX_A]] = [[\emptyset IX_A]]$$

A modifier with a null head noun: found across languages

- English: *the rich* [Beatrice Santorini, pc]
- Relative clauses with null heads possible

(31) *Wo mai-de* hen gui.  
I buy-DE very expensive  
'The one I bought was expensive.'  
[Mandarin; Yuyin He, pc.]

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- Deverbal anaphors in Nicaraguan Sign Language

[Senghas 1995]

## Deverbal anaphors

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'a reduced, truncated form of a recently-signed verb... to refer back to the referent in the narrative that last served as the most salient argument of that verb' (p.139).

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'The bird laughs.'

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**[COLLECT]<sub>N</sub>** LOOK UP.

'**The collector** looks up.'

[NSL]

# IX<sub>LOC</sub> is not an index; it's a modifier

- **indices**: assigned for every discourse referent
- **loci**:
  - infrequent, marked
  - not always licensed
  - tracks with contrast

## 1. Markedness derived

- modifiers are added when referent is not salient
- *Minimize Restrictors!*

## 2. Introductory use derived

- modifiers can attach restrictively and non-restrictively

## Jin, who is at A

$\llbracket \text{JIN IX}_A \rrbracket = \llbracket \text{jin [who is at A]} \rrbracket$

'Jin'

What does it mean for Jin to be 'at A' though?



# Jin, who is at A

[[JIN IX<sub>A</sub>]] = [*jin* [who is at A] ]

'Jin'

What does it mean for Jin to be 'at A' though?

## Pragmatic extension of exophoric reference [Ahn 2020]

- Evident that Jin is not there
- Addressee accommodates; takes it as a label

## Pragmatic extension

Using an abstract label in speech:

- My friend, A, decided to call my other friend, B, but B didn't pick up because B didn't want to talk to A.
- There is this woman, {let's call her A / who I'll call A}
- Jin $\rightarrow$ A was talking to Jimin $\rightarrow$ B and she $\rightarrow$ B kicked her $\rightarrow$ A.

# Pointing in sign languages: Summary

## Initial focus on IX and loci

- Loci as overt indices
- Led to discussions on whether sign language makes meaning more visible than spoken languages [Schlenker 2018]

## Proposal

- Evaluating  $IX_{LOC}$  in relation to other anaphoric expressions in ASL suggests that  $IX_{LOC}$  isn't an anaphoric index.
- $IX_{LOC}$  is a modifier (just like  $\text{👉}_A$  in spoken languages)
  - an additional restriction added to help resolve referent
- No sign language-specific mechanism necessary!
  - $\llbracket IX_A \rrbracket = \llbracket \text{👉}_A \rrbracket$

# Language use → Semantics: Summary

## Simplifying analyses

- The interpretation and the distribution of an anaphoric expression depends on *other* expressions available in the language
  - What an expression competes with, and what it doesn't compete with, tells us what its underlying semantics might be

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### *Not in this talk:*

- Null arguments in East Asian languages

[Duguine 2014; Han et al. 2020; Hoji et al. 2003; Huang 1984; Kim 1999; Kurafuji 2019; Oku 1998; Otani & Whitman 1991; Park 1994; Takahashi 2007; Yoon 1985, a.o.]

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  - Song & Lee 2009: No Repeated Noun Penalty in Korean { $\emptyset$ , NP}



## **Conclusion**

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# Conclusion

1. A unified semantic structure for all anaphoric expressions
  - Only differ in the kind and number of restrictions
2. Competition is naturally derived from the meaning
  - Bare Noun Blocking pronoun vs. N
3. This provides a link between semantics and language use:
  - **Semantics to Language use:**  
Cross-linguistic (processing penalty vs. blocking), and individual-level (interaction between alternatives) variation
  - **Language use to Semantics:**  
Distributional properties inform the semantics, allowing for a simpler analysis of IX<sub>LOC</sub> in ASL.

# Cross-linguistic typology

An interpretation of an anaphoric expression in a language depends

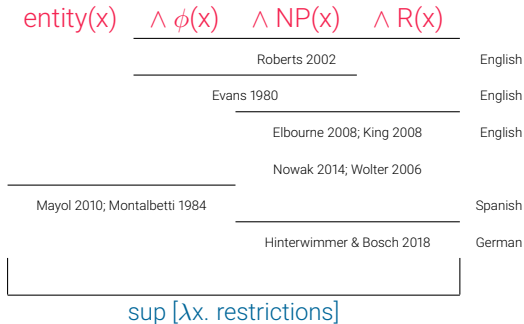
- indirectly on its morphosyntactic category
  - Not the category {pronoun, definite, demonstrative, etc.}
  - But the restrictions lexicalized
- and on the availability of other expressions in the language

→ Motivation for looking at the full spectrum of expressions in making cross-linguistic comparisons.

# A small extension

pro	pronoun	DEF	DEM
<hr/>			
		Roberts 2002	English
<hr/>			
	E-type (Evans 1980)		English
<hr/>			
		Elbourne 2008; King 2008	English
<hr/>			
		Nowak 2014; Wolter 2006	
<hr/>			
	Mayol 2010; Montalbetti 1984		Spanish
<hr/>			
		Hinterwimmer & Bosch 2018	German

## A small extension



- Unified account that derives distributional properties with independent economy principles.

## Thank you!

Special thanks to Gennaro Chierchia, Uli Sauerland, Kate Davidson, Diane Lillo-Martin, Annemarie Kocab, Veneeta Dayal, Hyun-joo Song, Chungmin Lee, Jesse Snedeker, Simon Charlow, Florian Schwarz, Harvard Meaning & Modality Lab, and Rutgers SURGE for their helpful comments and advice!

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